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Engineering Skills Technical Report

Engineering Skills (ACHA4022A)

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1. Introduction

This Technical report will cover some of the key topics within the field of engineering, such as considerations made towards Health and Safety, and the different implications this can have on individual tasks, as well as risk assessments that should be completed on different activities and why. Other topics such as Security risks will be discussed and how technological advancements make this an ever-increasing threat. This report will also highlight the role of Engineers in society, such as what it means to be a chartered engineer, and the high expectations and responsibilities for engineers. Furthermore, Problem solving is an important topic in engineering, including but not limited to identifying problems before, during, and after production or development cycles. Engineers are also expected to work in teams regularly on projects, this report will include a team structure example as seen from the perspective of the writer of this report.

2. Health and Safety with Risk Assessments.

Health and Safety is one of the most important aspects of most jobs and roles in society, and engineering is no exception. As a result, there are many considerations that need to be made towards all operations and tasks, big or small that are encountered on a daily basis, all with varying levels of importance or significance. One such example would be using a Lathe, the ones used in room IQ021A of the IQ Building. According to the UK legislation for preparing and using lathes for turning operations (Ukstandards.org.uk), there are many different criteria that must be met before using machinery like this:

For the performance criteria you must be able to:

- Work safely at all times, comply with health and safety regulations, and other relevant guidelines
- Plan machining tasks before starting them
- Obtain all necessary tools, materials and equipment
- Mount, set and adjust the relevant tools, equipment and workpiece, as well as the speeds of rotating machinery correctly
- Safely use machine tool controls in line with all operational procedures
- Measure and check the dimensions of the component, and make sure they are to specification
- Deal with problems within your control effectively and promptly, or seek guidance from other relevant people if you have issues you cannot resolve
- Shut off equipment to a safe condition on the completion of the task.

For each and every task an engineer might face, a relevant risk assessment should also be completed. Risk assessments are very important in industry, as they help to ensure that risks are minimised, and that damage to equipment, the environment, and any impacts to life are minimised and protected the best they can be. This can be done in many different ways, such as the use of Personal Protective Equipment (PPE).

Here is an example of a Risk assessment, that would be appropriate for tasks or activities using a lathe.

Hazards	At Risk	Likelyhood	Action
Damage to eyes from flying swarf and other metal particles.	Anybody in the room.	Very High	• Wear suitable eye protection when the machinery is running. • Wear long sleeve clothing.
Tool or workpiece breaking and flying out.	Anybody in the room.	High	• Make sure that the tool or workpiece is seated correctly and secured properly before operation.
Getting caught on rotating parts of the machinery	Machine Operator, people in close proximity.	High	• Operators should not wear loose clothing, or tie back and cover up long hair.
Being cut by swarf left behind on and under the machine	Anybody in the room.	Medium	• Wear protective gloves when removing swarf • Make sure machine power is switched off
Electrocution	Anybody in the room.	Low	• Make sure that there are no frayed or loose wires on the machine. • Make sure electrical safety tests on the machine are up to date.

3. Security Risk Matrix

As technological advancements are made, technology becomes increasingly more integrated into our lives. A place where this is more and more noticeable is transport, with the current advancements made towards autonomous vehicles. However, as these vehicles become more connected and autonomous, they can become more vulnerable to security threats such as cyber attacks, and malware. In 2015, there was 1.4 million vehicle recalls in the USA alone for cyber security vulnerabilities (TUV SUD, 2018).

There are plenty of physical and digital threats that the automotive industry faces, such as the ones listed below:

Remote vehicle hacking: Anybody with the right knowledge and equipment can access vehicles that are connected to networks over the air, and control features like steering, acceleration and braking, starting or stopping the engine, unlocking or locking doors, and more. (Vakulov, 2025) Software patches are able to fix these vulnerabilities sometimes, but this also depends on how quickly and effectively manufacturers can roll out these updates, and for how long each vehicle is supported.

Data breaches: As vehicles become more connected, often companies will require you to create accounts to use their software, giving details such as your email, your address, name, date of birth, phone number, and even banking details (Martin, 2025). This can result in fraud, and even identity theft.

Supply chain disruptions: In modern vehicles, there are an ever increasing number of parts, such as computers, and other systems using semiconductors. Shortages of these components can completely halt productions lines, with plenty of cars sat missing vital components for safety systems, autonomous driving, and entertainment systems (Crooks, 2022).

Vehicle theft and vandalism: More and more car manufacturers implement systems such as keyless starting and hands free entry to cars, to make using vehicles easier for drivers, as long as the key is in close proximity to the car, however this can be exploited by criminals. Devices that can scan nearby keys can be used to unlock and start

vehicles, enabling bad actors to steal cars from their owners driveways, with over 60% of car thefts involving cars with these features (Vardy, 2025).

Below is a Risk Matrix showing the Likelihood and Severity of these threats.

		IMPACT					
LIKELIHOOD		Negligible	Moderate	Severe	Catastrophic		Key
	Very Likely						Very Low
	Likely		Data Breaches				Low
	Possible			Vehicle Theft and Vandilism	Supply Chain Disruptions		Medium
	Unlikely			Remote Vehicle Hacking			High
	Very Unlikely						Very High

According to the Risk Matrix, the highest risk is disruption to the supply chain of parts for new vehicles. There are many ways to mitigate this problem however so that it doesn't happen again in the future. This could be anything from having a large backstock of parts for the assembly line, so that if a supplier has issues getting products out, or a general supply shortage across the industry, you have a backup plan. Another option is ordering parts from a wide range of suppliers, being less dependant on one source where possible allows for an extra layer of redundancy.

4. Engineers Role in Society

Engineers are held to a very high standard, especially Chartered Engineers. A Chartered Engineer is a title given to engineers that can demonstrate the required professional competences and commitment for the UK-SPEC Standard (Engc.org.uk, 2025).

All Engineers, not just Chartered Engineers have a code of conduct that they should follow. This code of conduct has been set out by the Engineering Council and the Royal Academy of Engineering (Engc.org.uk, 2017), which outlines how any Engineer should engage with engineering.

There are many ethical principles that are outlined in this code of conduct that engineers are encouraged to consider in their careers, such as movements in aid of sustainability and the environment. Many companies already have plans and strategies to balance these, without losing their identity, one of these is Aston Martin. As of 2024, they ran all of their manufacturing sites off of 100% renewable electricity, and are on their way towards Net Zero with their plan to tackle Climate change (Aston Martin Lagonda, 2024).

OUR SUSTAINABILITY STRATEGY: RACING. GREEN.		
OUR VISION To become a world-leading sustainable ultra-luxury automotive business		
TACKLING CLIMATE CHANGE	CREATING A BETTER ENVIRONMENT	INVESTING IN PEOPLE
Reduce absolute Scope 1, 2 and 3 GHG emissions 42% by 2030, from a 2022 base year Reduce absolute Scope 1, 2 and 3 GHG emissions 90% by 2050, from a 2022 base year	Improve biodiversity year-on-year at our manufacturing sites (measured by Biodiversity Index Score) 30% reduction in water consumption per car by 2030 Zero waste to landfill Reduce the amount of waste per car built by 3% each year	Zero accidents in our business Aim for women in 30% of leadership positions by 2030 Improve workplace engagement and culture, and secure accreditation as a Great Place to Work® by 2025
RESPONSIBLE BUSINESS		
In line with international best practice on business ethics, 100% of employees to complete Aston Martin's annual Code of Conduct training		

Figure 1 - Aston Martin's Sustainability Strategy (Aston Martin Lagonda, 2024)

5. Problem Solving

Engineers can face problems on a regular basis within the industry, regardless of the scope of the project. It is important that procedures are put in place to solve problems if they are found during any stage of a project, including post production, if the project has made its way to the buyer or consumer of the product.

During the development cycle, it is much easier to rectify mistakes than post development, and there are many options an engineering team could consider to combat these issues. One of these is Design thinking (Boyles, 2023). Design thinking is an effective solution-based approach to problem solving using a simple 4 stage structure.

- Clarify – In this stage, a situation or problem needs to be observed without bias, and the problems or key takeaways need to be laid out, an taken from the point of view and needs of a consumer or audience, rather than as an engineer.
- Ideate – This is where you explore potential solutions to the problems outlined in the first stage, consider the tools and resources you have available and how they can be used to solve these problems.
- Develop – The development stage builds on the previous stages, where you can prototype and experiment with different ways to implement these ideas into the product, and find the most effective way to solve these problems
- Implement – Once a suitable solution to the problem has been developed and tested, it can be implemented into the final design.

Another way of optimising development and problem solving is with flow charts. Flow charts make problem solving easy by visually showing not only the timeline of where the development cycle of a project is at, but what steps to take after the current task is completed.

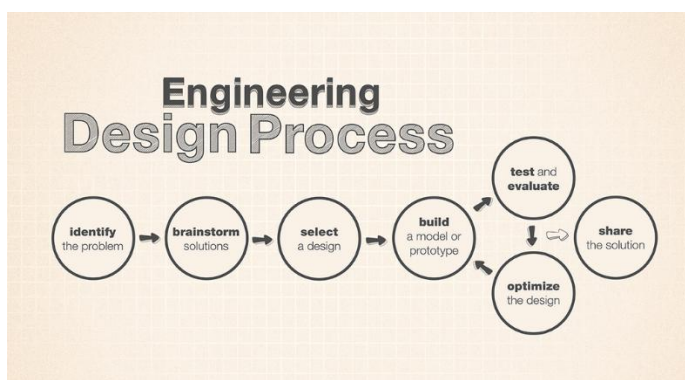


Figure 2 - Engineering design flow chart (NASA - 2024)

6. Team Structure

Working in teams as an Engineer is very important, as it enables projects of any scale to be seen from multiple perspectives. Often certain ideas and ways of completing tasks can be more streamlined, efficient and refined over time, and having these different perspectives helps to accomplish this. To reflect on a time that I, the writer, have worked in a team to accomplish a task, during my foundation year of university we had a bridge building exercise in our induction week. My team and I shared ideas on how we all thought the best way to construct a bridge would be. We were rather limited on materials, being given only coffee stirrers, string, paper, and tape. We all came to the conclusion that we should use triangular shapes to construct the main body of the bridge, as it is commonly used in bridge building. This is because triangles are the strongest and most stable geometric shape (Let's Talk Science, 2020).

Our team had a flat or horizontal team structure, where responsibility is equal and hierarchy is eliminated. This worked well in many ways, as nobody felt like their opinion was valued lower than anyone else in the team, and that nobody took over the project. It also helped with having more open communication, especially as most people there hadn't spoken much, or at all beforehand. However, this structure also has its own flaws – not having any one person with a higher power in decision making did cause conflict when different ideas were presented for how the bridge should be constructed, there was not many ideas that were approved unanimously.

If I worked on a similar project again, I think a functional organisational structure (Williams, 2017) would be a better fit, where participants are split into more specialised teams, that report back to an overall manager and communicate ideas, so that every part of the project is given the focus and attention to be completed properly and efficiently.

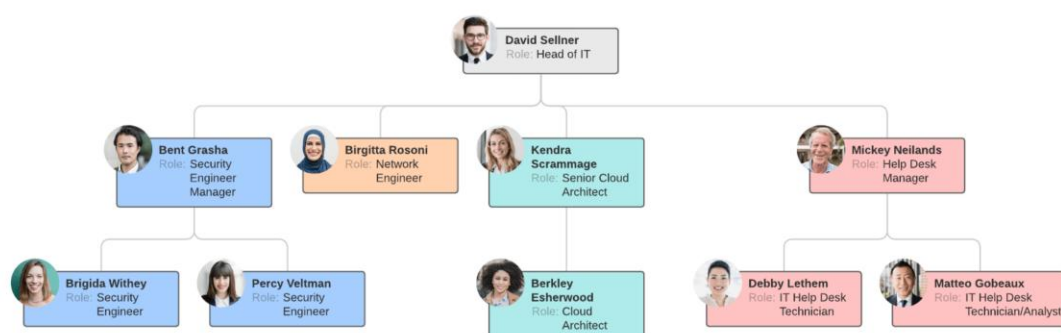


Figure 3 - Functional Organisational Structure – (Lucidchart, 2017)

7. Conclusion

To conclude, this technical report has been an insight into the many roles of an engineer, and all of the skills and factors they need to consider in the industry throughout their careers. Engineers need to be vigilant with security, follow proper health and safety guidelines, and consider how every action they take will directly or indirectly affect peoples lives, as well as the environment. Engineers need to be capable of unbiased problem solving, as well as being able to communicate and work with their peers on projects of any scale.

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